

CHAPTER 27

Solved Problems

P.27.15 Prashant is bullish about the index. Spot Nifty stands at Rs 1,100. He decides to buy one three-month Nifty call option contract (having a market lot of 200) with a strike price of Rs 1,160 at a premium of Rs 15 per call. Three months later, the index closes at Rs 1,195. Determine the amount of profit (or loss) to Prashant.

Solution Prashant gains as on the date of maturity the Nifty Index is higher than the exercise price. His gain gets reduced by the option premium paid. Accordingly, his gain is $(Rs\ 1,195 - Rs\ 1,160 - Rs\ 15) \times 200$ lot size = $Rs\ 20 \times 200 = Rs\ 4,000$.

P.27.16 Akram is bearish about the index. Spot Nifty stands at Rs 1,240. He decides to buy one three-month Nifty put option contract with a strike price of Rs 1,225, at Rs 34.50 a put. Three months later the index closes at Rs 1,280. Compute his payoff on the position.

Solution The put option expires out-of-the money as the exercise price at which Akram can sell is lower (Rs 1,225) than the market price (Rs 1,280) on the date of maturity. So, he loses the put premium he paid, that is $(Rs\ 34.50 \times 200) = Rs\ 6,900$ at the time of contract.

P.27.17 Mohan is bearish about the index. Spot Nifty stands at Rs 1,150. He decides to sell one three-month Nifty call option contract with a strike of Rs 1,175 for a premium of Rs 28.60. Three months later, the index closes at Rs 1,195. What is his net payoff on the position?

Solution Since the index closes above the strike price of Rs 1,175, the call option buyer exercises the option. As a result, he loses. $(Rs\ 1,195 - Rs\ 1,175 = Rs\ 20)$. But he has received an up-front premium Rs 28.60. Therefore, his net profits are $Rs\ 8.6 \times 200 = Rs\ 1,720$.

Review Questions

- 27.16** Mr. Garg is bullish about the index. Spot Nifty stands at Rs 1,125. He decides to buy one three-month Nifty call option contract with a strike price of Rs 1,160, at Rs 15 a call. Three months later the index closes at 1,135. Compute his payoff on the position.
- 27.17** Suresh is bearish about the index. Spot Nifty stands at Rs 1,250. He decides to sell one three-month Nifty call option contract with a strike of Rs 1,275 for a premium of Rs 28.60. Three months later, the index closes at 1,225. Compute his payoff on the position.
- 27.18** An investor buys one market lot of January 1,260 Nifty calls at Rs 96 a call, and sells one market lot of January 1,350 Nifty calls for Rs 55 a call. If, on the expiration date the Nifty closes at Rs 1,375, compute the pay off, net of costs from this spread position.
- 27.19** If the continuously compounded annual risk-free rate is 0.1133 per cent. Compute the r used in the BS formula.
- 27.20** On February 1, a three-month call option on the Nifty with a strike price of Rs 1,250 is available for trading. Compute the ' f ' that is used in the BS formula.
- 27.21** A three-month call option on the Nifty with a strike price of Rs 1,280 is available for trading. Nifty stands at Rs 1,260 and has a volatility of 30 per cent per annum. If the continuously compounded annual risk-free rate is 0.1133, compute the price of the call option and put option, using BS formula.

Answers

- 27.16** Loss = Rs 3,000
27.17 Profit = Rs 5,720
27.18 Profit = Rs 9,800
27.19 0.1133
27.20 0.25
27.21 Call option Rs 83.10, Put option Rs 67.35

TABLE A-6 Natural Logarithms

| | | | | | | | | | | | | | | | | | | | |
|-----|--------|------|------|------|------|------|------|------|------|------|---|---|---|---|---|---|----|----|----|
| 6.7 | 1.9021 | 9036 | 9051 | 9066 | 9081 | 9095 | 9110 | 9125 | 9140 | 9155 | 1 | 3 | 4 | 6 | 7 | 9 | 10 | 12 | 13 |
| 6.8 | 1.9169 | 9184 | 9199 | 9213 | 9228 | 9242 | 9257 | 9272 | 9286 | 9301 | 1 | 3 | 4 | 6 | 7 | 9 | 10 | 12 | 13 |
| 6.9 | 1.9315 | 9330 | 9344 | 9359 | 9373 | 9387 | 9402 | 9416 | 9430 | 9445 | 1 | 3 | 4 | 6 | 7 | 9 | 10 | 12 | 13 |
| 7.0 | 1.9459 | 9473 | 9488 | 9502 | 9516 | 9530 | 9544 | 9559 | 9573 | 9587 | 1 | 3 | 4 | 6 | 7 | 9 | 10 | 11 | 13 |
| 7.1 | 1.9601 | 9615 | 9629 | 9643 | 9657 | 9671 | 9685 | 9699 | 9713 | 9727 | 1 | 3 | 4 | 6 | 7 | 8 | 10 | 11 | 13 |
| 7.2 | 1.9741 | 9755 | 9769 | 9782 | 9796 | 9810 | 9824 | 9838 | 9851 | 9865 | 1 | 3 | 4 | 6 | 7 | 8 | 10 | 11 | 12 |
| 7.3 | 1.9879 | 9892 | 9906 | 9920 | 9933 | 9947 | 9961 | 9974 | 9988 | 0001 | 1 | 3 | 4 | 5 | 7 | 8 | 10 | 11 | 12 |
| 7.4 | 2.0015 | 0028 | 0042 | 0055 | 0069 | 0082 | 0096 | 0109 | 0122 | 0136 | 1 | 3 | 4 | 5 | 7 | 8 | 9 | 11 | 12 |
| 7.5 | 2.0149 | 0162 | 0176 | 0189 | 0202 | 0215 | 0229 | 0242 | 0255 | 0268 | 1 | 3 | 4 | 5 | 7 | 8 | 9 | 11 | 12 |
| 7.6 | 2.0281 | 0295 | 0308 | 0321 | 0334 | 0347 | 0360 | 0373 | 0386 | 0399 | 1 | 3 | 4 | 5 | 7 | 8 | 9 | 10 | 12 |
| 7.7 | 2.0412 | 0425 | 0438 | 0451 | 0464 | 0477 | 0490 | 0503 | 0516 | 0528 | 1 | 3 | 4 | 5 | 6 | 8 | 9 | 10 | 12 |
| 7.8 | 2.0541 | 0554 | 0567 | 0580 | 0592 | 0605 | 0618 | 0631 | 0643 | 0656 | 1 | 3 | 4 | 5 | 6 | 8 | 9 | 10 | 11 |
| 7.9 | 2.0668 | 0681 | 0694 | 0707 | 0719 | 0732 | 0744 | 0757 | 0769 | 0782 | 1 | 3 | 4 | 5 | 6 | 8 | 9 | 10 | 11 |
| 8.0 | 2.0794 | 0807 | 0819 | 0832 | 0844 | 0857 | 0869 | 0882 | 0894 | 0906 | 1 | 3 | 4 | 5 | 6 | 7 | 9 | 10 | 11 |
| 8.1 | 2.0919 | 0931 | 0943 | 0956 | 0968 | 0980 | 0992 | 1005 | 1017 | 1029 | 1 | 2 | 4 | 5 | 6 | 7 | 9 | 10 | 11 |
| 8.2 | 2.1041 | 1054 | 1066 | 1078 | 1090 | 1102 | 1114 | 1126 | 1138 | 1150 | 1 | 2 | 4 | 5 | 6 | 7 | 9 | 10 | 11 |
| 8.3 | 2.1163 | 1175 | 1187 | 1199 | 1211 | 1223 | 1235 | 1247 | 1258 | 1270 | 1 | 2 | 4 | 5 | 6 | 7 | 9 | 10 | 11 |
| 8.4 | 2.1282 | 1294 | 1306 | 1318 | 1330 | 1342 | 1353 | 1365 | 1377 | 1389 | 1 | 2 | 4 | 5 | 6 | 7 | 8 | 10 | 11 |
| 8.5 | 2.1401 | 1412 | 1424 | 1436 | 1448 | 1459 | 1471 | 1483 | 1494 | 1506 | 1 | 2 | 4 | 5 | 6 | 7 | 8 | 9 | 11 |
| 8.6 | 2.1518 | 1529 | 1541 | 1552 | 1564 | 1576 | 1587 | 1599 | 1610 | 1622 | 1 | 2 | 3 | 5 | 6 | 7 | 8 | 9 | 10 |
| 8.7 | 2.1633 | 1645 | 1656 | 1668 | 1679 | 1691 | 1702 | 1713 | 1725 | 1736 | 1 | 2 | 3 | 5 | 6 | 7 | 8 | 9 | 10 |
| 8.8 | 2.1748 | 1759 | 1770 | 1782 | 1793 | 1804 | 1815 | 1827 | 1838 | 1849 | 1 | 2 | 3 | 5 | 6 | 7 | 8 | 9 | 10 |
| 8.9 | 2.1861 | 1872 | 1883 | 1894 | 1905 | 1917 | 1928 | 1939 | 1950 | 1961 | 1 | 2 | 3 | 4 | 6 | 7 | 8 | 9 | 10 |
| 9.0 | 2.1972 | 1983 | 1994 | 2006 | 2017 | 2028 | 2039 | 2050 | 2061 | 2072 | 1 | 2 | 3 | 4 | 6 | 7 | 8 | 9 | 10 |
| 9.1 | 2.2083 | 2094 | 2105 | 2116 | 2127 | 2138 | 2148 | 2159 | 2170 | 2181 | 1 | 2 | 3 | 4 | 5 | 7 | 8 | 9 | 10 |
| 9.2 | 2.2192 | 2203 | 2214 | 2225 | 2235 | 2246 | 2257 | 2268 | 2279 | 2289 | 1 | 2 | 3 | 4 | 5 | 6 | 8 | 9 | 10 |
| 9.3 | 2.2300 | 2311 | 2322 | 2332 | 2343 | 2354 | 2364 | 2375 | 2386 | 2396 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 9 | 10 |
| 9.4 | 2.2407 | 2418 | 2428 | 2439 | 2450 | 2460 | 2471 | 2481 | 2492 | 2502 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 |
| 9.5 | 2.2513 | 2523 | 2534 | 2544 | 2555 | 2565 | 2576 | 2586 | 2597 | 2607 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 9.6 | 2.2618 | 2628 | 2638 | 2649 | 2659 | 2670 | 2680 | 2690 | 2701 | 2711 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 9.7 | 2.2721 | 2732 | 2742 | 2752 | 2762 | 2773 | 2783 | 2793 | 2803 | 2814 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 9.8 | 2.2824 | 2834 | 2844 | 2854 | 2865 | 2875 | 2885 | 2895 | 2905 | 2915 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 9.9 | 2.2925 | 2935 | 2946 | 2956 | 2966 | 2976 | 2986 | 2996 | 3006 | 3016 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

TABLE A-7 The Values of e^{-x}

| x | e^{-x} | x | e^{-x} | x | e^{-x} |
|------|----------|------|----------|------|----------|
| 0.00 | 1.0000 | 0.51 | 0.6005 | 1.01 | 0.3642 |
| 01 | 0.9901 | 52 | 0.5945 | 02 | 0.3606 |
| 02 | 0.9802 | 53 | 0.5886 | 03 | 0.3570 |
| 03 | 0.9704 | 54 | 0.5827 | 04 | 0.3535 |
| 04 | 0.9608 | 55 | 0.5769 | 05 | 0.3499 |
| 05 | 0.9512 | 56 | 0.5712 | 06 | 0.3465 |
| 06 | 0.9418 | 57 | 0.5655 | 07 | 0.3430 |
| 07 | 0.9324 | 58 | 0.5599 | 08 | 0.3396 |
| 08 | 0.9231 | 59 | 0.5543 | 09 | 0.3362 |
| 09 | 0.9139 | 0.60 | 0.5488 | 1.10 | 0.3329 |
| 0.10 | 0.9048 | 61 | 0.5434 | 11 | 0.3296 |
| 11 | 0.8958 | 62 | 0.5379 | 12 | 0.3263 |
| 12 | 0.8869 | 63 | 0.5326 | 13 | 0.3230 |
| 13 | 0.8781 | 64 | 0.5273 | 14 | 0.3198 |
| 14 | 0.8694 | 65 | 0.5220 | 15 | 0.3166 |
| 15 | 0.8607 | 66 | 0.5169 | 16 | 0.3135 |
| 16 | 0.8521 | 67 | 0.5117 | 17 | 0.3104 |
| 17 | 0.8437 | 68 | 0.5066 | 18 | 0.3073 |
| 18 | 0.8353 | 69 | 0.5016 | 19 | 0.3042 |
| 19 | 0.8270 | 0.70 | 0.4966 | 1.20 | 0.3012 |
| 0.20 | 0.8187 | 71 | 0.4916 | 21 | 0.2982 |
| 21 | 0.8106 | 72 | 0.4868 | 22 | 0.2952 |
| 22 | 0.8025 | 73 | 0.4819 | 23 | 0.2923 |

| | | | | | |
|------|--------|------|--------|------|--------|
| 23 | 0.7945 | 74 | 0.4771 | 24 | 0.2894 |
| 24 | 0.7866 | 75 | 0.4724 | 25 | 0.2865 |
| 25 | 0.7788 | 76 | 0.4677 | 26 | 0.2837 |
| 26 | 0.7711 | 77 | 0.4630 | 27 | 0.2808 |
| 27 | 0.7634 | 78 | 0.4584 | 28 | 0.2780 |
| 28 | 0.7558 | 79 | 0.4538 | 29 | 0.2753 |
| 29 | 0.7483 | 0.80 | 0.4493 | 1.30 | 0.2725 |
| 0.30 | 0.7408 | 81 | 0.4449 | 31 | 0.2698 |
| 31 | 0.7334 | 82 | 0.4404 | 32 | 0.2671 |
| 32 | 0.7262 | 83 | 0.4361 | 33 | 0.2645 |
| 33 | 0.7189 | 84 | 0.4317 | 34 | 0.2618 |
| 34 | 0.7118 | 85 | 0.4274 | 35 | 0.2592 |
| 35 | 0.7047 | 86 | 0.4232 | 36 | 0.2567 |
| 36 | 0.6977 | 87 | 0.4190 | 37 | 0.2541 |
| 37 | 0.6907 | 88 | 0.4148 | 38 | 0.2516 |
| 38 | 0.6839 | 89 | 0.4107 | 39 | 0.2491 |
| 39 | 0.6771 | 0.90 | 0.4066 | 1.40 | 0.2466 |
| 0.40 | 0.6703 | 91 | 0.4025 | 41 | 0.2441 |
| 41 | 0.6637 | 92 | 0.3985 | 42 | 0.2417 |
| 42 | 0.6570 | 93 | 0.3946 | 43 | 0.2393 |
| 43 | 0.6505 | 94 | 0.3906 | 44 | 0.2369 |
| 44 | 0.6440 | 95 | 0.3867 | 45 | 0.2346 |

TABLE A-7 (Contd.)

| x | e^{-x} | x | e^{-x} | x | e^{-x} |
|------|----------|------|----------|------|----------|
| 46 | 0.6313 | 97 | 0.3791 | 47 | 0.2299 |
| 47 | 0.6250 | 98 | 0.3753 | 48 | 0.2276 |
| 48 | 0.6188 | 99 | 0.3716 | 49 | 0.2254 |
| 49 | 0.6126 | 1.00 | 0.3679 | 1.50 | 0.2231 |
| 0.50 | 0.6065 | | | | |
| 1.51 | 0.2209 | 2.01 | 0.1340 | 2.80 | 0.0608 |
| 52 | 0.2187 | 02 | 0.1327 | 85 | 0.0578 |
| 53 | 0.2165 | 03 | 0.1313 | 90 | 0.0550 |
| 54 | 0.2144 | 04 | 0.1300 | 95 | 0.0523 |
| 55 | 0.2122 | 05 | 0.1287 | 3.00 | 0.0498 |
| 56 | 0.2101 | 06 | 0.1275 | 05 | 0.0474 |
| 57 | 0.2080 | 07 | 0.1262 | 10 | 0.0451 |
| 58 | 0.2060 | 08 | 0.1249 | 15 | 0.0429 |
| 59 | 0.2039 | 09 | 0.1237 | 20 | 0.0408 |
| 1.60 | 0.2019 | 2.10 | 0.1225 | 25 | 0.0388 |
| 61 | 0.1999 | 11 | 0.1212 | 30 | 0.0369 |
| 62 | 0.1979 | 12 | 0.1200 | 35 | 0.0351 |
| 63 | 0.1959 | 13 | 0.1188 | 40 | 0.0334 |
| 64 | 0.1940 | 14 | 0.1177 | 45 | 0.0318 |
| 65 | 0.1920 | 15 | 0.1167 | 3.50 | 0.0302 |
| 66 | 0.1901 | 16 | 0.1153 | 55 | 0.0287 |
| 67 | 0.1883 | 17 | 0.1142 | 60 | 0.0273 |
| 68 | 0.1864 | 18 | 0.1130 | 65 | 0.0260 |
| 69 | 0.1845 | 19 | 0.1119 | 70 | 0.0247 |
| 1.70 | 0.1827 | 2.20 | 0.1108 | 75 | 0.0235 |
| 71 | 0.1809 | 21 | 0.1097 | 80 | 0.0224 |
| 72 | 0.1791 | 22 | 0.1086 | 85 | 0.0213 |
| 73 | 0.1773 | 23 | 0.1075 | 90 | 0.0202 |
| 74 | 0.1755 | 24 | 0.1065 | 95 | 0.0193 |
| 75 | 0.1738 | 25 | 0.1054 | 4.00 | 0.0183 |
| 76 | 0.1720 | 26 | 0.1044 | 05 | 0.0174 |
| 77 | 0.1703 | 27 | 0.1033 | 10 | 0.0166 |
| 78 | 0.1686 | 28 | 0.1023 | 15 | 0.0158 |

| | | | | | |
|------|--------|------|--------|----|--------|
| 79 | 0.1670 | 29 | 0.1013 | 20 | 0.0150 |
| 1.80 | 0.1653 | 2.30 | 0.1003 | 25 | 0.0143 |
| 81 | 0.1637 | 31 | 0.0993 | 30 | 0.0136 |
| 82 | 0.1620 | 32 | 0.0983 | 35 | 0.0129 |
| 83 | 0.1604 | 33 | 0.0973 | 40 | 0.0123 |
| 84 | 0.1588 | 34 | 0.0963 | 45 | 0.0117 |
| 85 | 0.1572 | 35 | 0.0954 | 50 | 0.0111 |
| 86 | 0.1557 | 36 | 0.0944 | 55 | 0.0106 |
| 87 | 0.1541 | 37 | 0.0935 | 60 | 0.0101 |
| 88 | 0.1526 | 38 | 0.0926 | 65 | 0.0096 |
| 89 | 0.1511 | 39 | 0.0916 | 70 | 0.0091 |
| 1.90 | 0.1496 | 2.40 | 0.0907 | 75 | 0.0087 |
| 91 | 0.1481 | 41 | 0.0898 | 80 | 0.0082 |
| 92 | 0.1466 | 42 | 0.0889 | 85 | 0.0078 |

TABLE A-7 (Contd.)

| x | e^{-x} | x | e^{-x} | x | e^{-x} |
|------|----------|------|----------|------|----------|
| 93 | 0.1452 | 43 | 0.0880 | 90 | 0.0075 |
| 94 | 0.1437 | 44 | 0.0872 | 95 | 0.0071 |
| 95 | 0.1423 | 45 | 0.0863 | 5.00 | 0.0067 |
| 96 | 0.1409 | 46 | 0.0854 | 10 | 0.0061 |
| 97 | 0.1395 | 47 | 0.0846 | 20 | 0.0055 |
| 98 | 0.1381 | 48 | 0.0837 | 30 | 0.0050 |
| 99 | 0.1367 | 49 | 0.0829 | 40 | 0.0045 |
| 2.00 | 0.1353 | 2.50 | 0.0821 | 50 | 0.0041 |
| | | 55 | 0.0781 | 60 | 0.0037 |
| | | 60 | 0.0743 | 70 | 0.0034 |
| | | 65 | 0.0707 | 80 | 0.0030 |
| | | 70 | 0.0672 | 90 | 0.0027 |
| | | 75 | 0.0639 | 6.00 | 0.0025 |

TABLE A-8 Cumulative Standardised Normal Probability Distribution

Table for $N(x)$ When $x \geq 0$

This table shows values of $N(x)$ for $x \geq 0$. The table should be used with interpolation. For example,

$$N(0.6278) = N(0.62) + 0.78[N(0.63) - N(0.62)]$$

$$= 0.7324 + 0.78 \times (0.7357 - 0.7324) = 0.7350$$

| x | 0.00 | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 |
|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0.0 | 0.5000 | 0.5040 | 0.5080 | 0.5120 | 0.5160 | 0.5199 | 0.5239 | 0.5279 | 0.5319 | 0.5359 |
| 0.1 | 0.5398 | 0.5438 | 0.5478 | 0.5517 | 0.5557 | 0.5596 | 0.5636 | 0.5675 | 0.5714 | 0.5753 |
| 0.2 | 0.5793 | 0.5832 | 0.5871 | 0.5910 | 0.5948 | 0.5987 | 0.6026 | 0.6064 | 0.6103 | 0.6141 |
| 0.3 | 0.6179 | 0.6217 | 0.6255 | 0.6293 | 0.6331 | 0.6368 | 0.6406 | 0.6443 | 0.6480 | 0.6517 |
| 0.4 | 0.6554 | 0.6591 | 0.6628 | 0.6664 | 0.6700 | 0.6736 | 0.6772 | 0.6808 | 0.6844 | 0.6879 |
| 0.5 | 0.6915 | 0.6950 | 0.6985 | 0.7019 | 0.7054 | 0.7088 | 0.7123 | 0.7157 | 0.7190 | 0.7224 |
| 0.6 | 0.7257 | 0.7291 | 0.7324 | 0.7357 | 0.7389 | 0.7422 | 0.7454 | 0.7486 | 0.7517 | 0.7549 |
| 0.7 | 0.7580 | 0.7611 | 0.7642 | 0.7673 | 0.7704 | 0.7734 | 0.7764 | 0.7794 | 0.7823 | 0.7852 |
| 0.8 | 0.7881 | 0.7910 | 0.7939 | 0.7967 | 0.7995 | 0.8023 | 0.8051 | 0.8078 | 0.8106 | 0.8133 |
| 0.9 | 0.8159 | 0.8186 | 0.8212 | 0.8238 | 0.8264 | 0.8289 | 0.8315 | 0.8340 | 0.8365 | 0.8389 |
| 1.0 | 0.8413 | 0.8438 | 0.8461 | 0.8485 | 0.8508 | 0.8531 | 0.8554 | 0.8577 | 0.8599 | 0.8621 |
| 1.1 | 0.8643 | 0.8665 | 0.8686 | 0.8708 | 0.8729 | 0.8749 | 0.8770 | 0.8790 | 0.8810 | 0.8830 |
| 1.2 | 0.8849 | 0.8869 | 0.8888 | 0.8907 | 0.8925 | 0.8944 | 0.8962 | 0.8980 | 0.8997 | 0.9015 |
| 1.3 | 0.9032 | 0.9049 | 0.9066 | 0.9082 | 0.9099 | 0.9115 | 0.9131 | 0.9147 | 0.9162 | 0.9177 |
| 1.4 | 0.9192 | 0.9207 | 0.9222 | 0.9236 | 0.9251 | 0.9265 | 0.9279 | 0.9292 | 0.9306 | 0.9319 |
| 1.5 | 0.9332 | 0.9345 | 0.9357 | 0.9370 | 0.9382 | 0.9394 | 0.9406 | 0.9418 | 0.9429 | 0.9441 |
| 1.6 | 0.9452 | 0.9463 | 0.9474 | 0.9484 | 0.9495 | 0.9505 | 0.9515 | 0.9525 | 0.9535 | 0.9545 |
| 1.7 | 0.9554 | 0.9564 | 0.9573 | 0.9582 | 0.9591 | 0.9599 | 0.9608 | 0.9616 | 0.9625 | 0.9633 |

| | | | | | | | | | | |
|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1.8 | 0.9641 | 0.9649 | 0.9656 | 0.9664 | 0.9671 | 0.9678 | 0.9686 | 0.9693 | 0.9699 | 0.9706 |
| 1.9 | 0.9713 | 0.9719 | 0.9726 | 0.9732 | 0.9738 | 0.9744 | 0.9750 | 0.9756 | 0.9761 | 0.9767 |
| 2.0 | 0.9772 | 0.9778 | 0.9783 | 0.9788 | 0.9793 | 0.9798 | 0.9803 | 0.9808 | 0.9812 | 0.9817 |
| 2.1 | 0.9821 | 0.9826 | 0.9830 | 0.9834 | 0.9838 | 0.9842 | 0.9846 | 0.9850 | 0.9854 | 0.9857 |
| 2.2 | 0.9861 | 0.9864 | 0.9868 | 0.9871 | 0.9875 | 0.9878 | 0.9881 | 0.9884 | 0.9887 | 0.9890 |
| 2.3 | 0.9893 | 0.9896 | 0.9898 | 0.9901 | 0.9904 | 0.9906 | 0.9909 | 0.9911 | 0.9913 | 0.9916 |

TABLE A-8 (Contd.)

Table for $N(x)$ When $x \leq 0$

This table shows values of $N(x)$ for $x \leq 0$. The table should be used with interpolation. For example,
 $N(-0.6278) = N(-0.12) - 0.34[N(-0.12) - N(-0.13)]$
 $= 0.4522 - 0.34 \times (0.4522 - 0.4483) = 0.4509$

| x | 0.00 | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 |
|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 2.4 | 0.9918 | 0.9920 | 0.9922 | 0.9925 | 0.9927 | 0.9929 | 0.9931 | 0.9932 | 0.9934 | 0.9936 |
| 2.5 | 0.9938 | 0.9940 | 0.9941 | 0.9943 | 0.9945 | 0.9946 | 0.9948 | 0.9949 | 0.9951 | 0.9952 |
| 2.6 | 0.9953 | 0.9955 | 0.9956 | 0.9957 | 0.9959 | 0.9960 | 0.9961 | 0.9962 | 0.9963 | 0.9964 |
| 2.7 | 0.9965 | 0.9966 | 0.9967 | 0.9968 | 0.9969 | 0.9970 | 0.9971 | 0.9972 | 0.9973 | 0.9974 |
| 2.8 | 0.9974 | 0.9975 | 0.9976 | 0.9977 | 0.9977 | 0.9978 | 0.9979 | 0.9979 | 0.9980 | 0.9981 |
| 2.9 | 0.9981 | 0.9982 | 0.9982 | 0.9983 | 0.9984 | 0.9984 | 0.9985 | 0.9985 | 0.9986 | 0.9986 |
| 3.0 | 0.9986 | 0.9987 | 0.9987 | 0.9988 | 0.9988 | 0.9989 | 0.9989 | 0.9989 | 0.9990 | 0.9990 |
| 3.1 | 0.9990 | 0.9991 | 0.9991 | 0.9991 | 0.9992 | 0.9992 | 0.9992 | 0.9992 | 0.9993 | 0.9993 |
| 3.2 | 0.9993 | 0.9993 | 0.9994 | 0.9994 | 0.9994 | 0.9994 | 0.9994 | 0.9995 | 0.9995 | 0.9995 |
| 3.3 | 0.9995 | 0.9995 | 0.9995 | 0.9996 | 0.9996 | 0.9996 | 0.9996 | 0.9996 | 0.9996 | 0.9997 |
| 3.4 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9998 |
| 3.5 | 0.9998 | 0.9998 | 0.9998 | 0.9998 | 0.9998 | 0.9998 | 0.9998 | 0.9998 | 0.9998 | 0.9998 |
| 3.6 | 0.9998 | 0.9998 | 0.9999 | 0.9999 | 0.9999 | 0.9999 | 0.9999 | 0.9999 | 0.9999 | 0.9999 |
| 3.7 | 0.9999 | 0.9999 | 0.9999 | 0.9999 | 0.9999 | 0.9999 | 0.9999 | 0.9999 | 0.9999 | 0.9999 |
| 3.8 | 0.9999 | 0.9999 | 0.9999 | 0.9999 | 0.9999 | 0.9999 | 0.9999 | 0.9999 | 0.9999 | 0.9999 |
| 3.9 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 4.0 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| -0.0 | 0.5000 | 0.4960 | 0.4920 | 0.4880 | 0.4840 | 0.4801 | 0.4761 | 0.4721 | 0.4681 | 0.4641 |
| -0.1 | 0.4602 | 0.4562 | 0.4522 | 0.4483 | 0.4443 | 0.4404 | 0.4364 | 0.4325 | 0.4286 | 0.4247 |
| -0.2 | 0.4207 | 0.4168 | 0.4129 | 0.4090 | 0.4052 | 0.4013 | 0.3974 | 0.3936 | 0.3897 | 0.3859 |
| -0.3 | 0.3821 | 0.3783 | 0.3745 | 0.3707 | 0.3669 | 0.3632 | 0.3594 | 0.3557 | 0.3520 | 0.3483 |
| -0.4 | 0.3446 | 0.3409 | 0.3372 | 0.3336 | 0.3300 | 0.3264 | 0.3228 | 0.3192 | 0.3156 | 0.3121 |
| -0.5 | 0.3085 | 0.3050 | 0.3015 | 0.2981 | 0.2946 | 0.2912 | 0.2877 | 0.2843 | 0.2810 | 0.2776 |
| -0.6 | 0.2743 | 0.2709 | 0.2676 | 0.2643 | 0.2611 | 0.2578 | 0.2546 | 0.2514 | 0.2483 | 0.2451 |
| -0.7 | 0.2420 | 0.2389 | 0.2358 | 0.2327 | 0.2296 | 0.2266 | 0.2236 | 0.2206 | 0.2177 | 0.2148 |
| -0.8 | 0.2119 | 0.2090 | 0.2061 | 0.2033 | 0.2005 | 0.1977 | 0.1949 | 0.1922 | 0.1894 | 0.1867 |
| -0.9 | 0.1841 | 0.1814 | 0.1788 | 0.1762 | 0.1736 | 0.1711 | 0.1685 | 0.1660 | 0.1635 | 0.1611 |
| -1.0 | 0.1587 | 0.1562 | 0.1539 | 0.1515 | 0.1492 | 0.1469 | 0.1446 | 0.1423 | 0.1401 | 0.1379 |
| -1.1 | 0.1357 | 0.1335 | 0.1314 | 0.1292 | 0.1271 | 0.1251 | 0.1230 | 0.1210 | 0.1190 | 0.1170 |
| -1.2 | 0.1151 | 0.1131 | 0.1112 | 0.1093 | 0.1075 | 0.1056 | 0.1038 | 0.1020 | 0.1003 | 0.0985 |
| -1.3 | 0.0968 | 0.0951 | 0.0934 | 0.0918 | 0.0901 | 0.0885 | 0.0869 | 0.0853 | 0.0838 | 0.0823 |
| -1.4 | 0.0808 | 0.0793 | 0.0778 | 0.0764 | 0.0749 | 0.0735 | 0.0721 | 0.0708 | 0.0694 | 0.0681 |
| -1.5 | 0.0668 | 0.0655 | 0.0643 | 0.0630 | 0.0618 | 0.0606 | 0.0594 | 0.0582 | 0.0571 | 0.0559 |
| -1.6 | 0.0548 | 0.0537 | 0.0526 | 0.0516 | 0.0505 | 0.0495 | 0.0485 | 0.0475 | 0.0465 | 0.0455 |
| -1.7 | 0.0446 | 0.0436 | 0.0427 | 0.0418 | 0.0409 | 0.0401 | 0.0392 | 0.0384 | 0.0375 | 0.0367 |
| -1.8 | 0.0359 | 0.0351 | 0.0344 | 0.0336 | 0.0329 | 0.0322 | 0.0314 | 0.0307 | 0.0301 | 0.0294 |
| -1.9 | 0.0287 | 0.0281 | 0.0274 | 0.0268 | 0.0262 | 0.0256 | 0.0250 | 0.0244 | 0.0239 | 0.0233 |
| -2.0 | 0.0228 | 0.0222 | 0.0217 | 0.0212 | 0.0207 | 0.0202 | 0.0197 | 0.0192 | 0.0188 | 0.0183 |
| -2.1 | 0.0179 | 0.0174 | 0.0170 | 0.0166 | 0.0162 | 0.0158 | 0.0154 | 0.0150 | 0.0146 | 0.0143 |
| -2.2 | 0.0139 | 0.0136 | 0.0132 | 0.0129 | 0.0125 | 0.0122 | 0.0119 | 0.0116 | 0.0113 | 0.0110 |
| -2.3 | 0.0107 | 0.0104 | 0.0102 | 0.0099 | 0.0096 | 0.0094 | 0.0091 | 0.0089 | 0.0087 | 0.0084 |

TABLE A-8* (Contd.)

